Environmental surveillance monitoring XYZ-La crosse

By

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Abstract

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There are variety of chemicals in the workplace. These variety of chemicals present variety of hazards. The primary purpose of monitoring air in the work environment is to determine the level of employees exposure to airborne contaminants and to protect employees health and safety.

The purpose of this study was to develop an exposure assessment plan for the XYZ-La Crosse treater rooms #13, 15 and the peel room in order to guide against exposure of employees to hazardous chemicals.

Air samples were taken in treater rooms #13, 15, and the peel room to determine whether or not employees working in these room were exposed during their eight-hour shift. Treater room #13 was monitored for methyl pyrrolidone and methyl ethyl ketone; treater room #15 was monitored for for dimethylformamide, methanol, and methyl ethyl

ketone; and the peel room was monitored for lead. The samples were analyzed by NATLSCO Lab in Long Grove IL and the results were compared to the ACGIH TLV's.

The results for methyl pyrrolidone and methyl ethyl ketone in treater room #13 were 3.0 ppm and 37 ppm compare to ACGIH TLV's of 100 ppm and 200 ppm respectively. Results for dimethylformamide, methyl ethyl ketone, and methanol in treater room #15 were: 9.2 ppm, 13 ppm, and 3.2 ppm compare to ACGIH TLV's of 10 ppm, 200 ppm, and 200 ppm respectively. The result for lead in the peel room was 0.0014 mg/m3 compare to ACGIH TLV of 0.05 mg/m3.

In view of the results of the various samples, there seems to be no significant health hazards at the XYZ- La Crosse treater rooms # 13, 15, and the peel room at the time of the study.

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Introduction

There are variety of chemicals in the workplace. These variety of chemicals present variety of hazards. The primary purpose of monitoring air in the work environment is to determine the level of employees exposure to airborne contaminants and to protect employees' health and safety. Generally where employees may be over exposed to potential health hazards, such sampling or measurement is performed on a routine basis. In addition, sampling for air contaminants may be performed for one or more of the following reasons: (1) to determine the magnitude of employee exposure at the start-up of a new process or a change in a process or material used; (2) to determine the justification of employee grievance concerning an alleged health hazard; (3) to determine the performance or effectiveness of engineering control measures; (4) for research purposes, such as to determine chemical and/or physical characteristics of contaminants, or (5) to investigate a potential health problem on a corporate wide basis. However, the majority of the sampling that plant personnel will be concerned with will be performed because of local or federal regulations. Those health standards promulgated under the Occupational Safety and Health Act (OSHA) require monitoring on a periodic basis, of all employees who are exposed to harmful materials (LaBar, 1997).

Developed in 1970, the Occupational Safety and Health Act (OSHA) safeguards workplace against unhealthy practices and mishaps. OSHA provides for periodic inspections to help guarantee compliance with safety related policies and procedures Maher, 1996). The government also mandates that companies that are affected by OSHA perform environmental monitoring in order to get a baseline to use in determining the frequency of further testing. At a minimum, the government requires that affected companies should monitor annually unless a problem exists. If it does, either quarterly or frequent monitoring is required. (CFR 1910 .1000).

Statement of the problem

There are quite a few people who would be amazed at the number of companies in America that work with various chemicals every day and have no idea what concentration of airborne contaminants their employees are being exposed to. The consequences of not knowing could be deadly or at the minimum could cause untold suffering.

Motivated by compliance issues and concern for employees health and safety at the XYZ- La Crosse plant, the author of this research paper decided to sample the air in treater room #13 for methyl pyrrolidone and methyl ethyl ketone; treater room #15 for dimethylformamide, methanol and methyl ethyl ketone and the peel room for lead.

Purpose of study

The purpose of the study was to develop an exposure assessment plan for the XYZ- La Crosse treater rooms number 13, 15,and the peel room in order to guide against exposure of employees to hazardous chemicals.

Objectives

The objectives of the study are:

1. Perform hazard assessment on methyl pyrrolidone, methyl ethyl keyone, dimethyl form amide, methanol, and lea
2. Perform environmental surveillance monitoring.

3. Compare results to ACGIH TLVs

Significance of study

In 1999 alone work related injuries in the private industry occurred at an incidence rate of 6.6 cases per 100 full-time workers. Within the manufacturing industry, one of which is the focus of this study, reported a rate of 8.9 Workers compensation and loss of properties were also reported in the billions (U S Dept of labor, 1999).

In light of this, the significance of the study was to promote a healthier and safer working environment for company XYZ employees and to ensure that company XYZ is in compliance with OSHA regulations. Hence, reduce incidence rate, workers compensation cost and potential loss of properties

Limitations

1.The study involves only XYZ- La Crosse facility and employees.

2.The study is limited to the literature reviewed for the purpose of the study.

3. The recommendations will only apply to the XYZ La Crosse employees working in treater rooms number 13, 15 and the peel room..

Assumptions

1.The assumption is made that the research data utilized for this study followed acceptable scientific research format.

2. It is assumed that the information obtained from this study will be used by XYZ to guide against employees exposure to chemical.

Definitions of Terms

The following definitions are some key terms that will be used in this study. Some terms are unique to the Risk Control/Industrial Hygiene field while others are common terms but carry different meanings in other fields. Along with definitions of terms are acronyms that will be referred to throughout the study.

Absorption- penetration through the skin by substances. Some substances are absorbed by way of the opening for hair follicles and other dissolve in the fat and oil of the skin, such as organic lead compounds, many nitro compounds, and organic phosphate pesticides.

ACGIH- American Conference of Governmental Industrial Hygienist.

Ceiling (TLV-C)- is the concentration that should not be exceeded even instantaneously.

Dust- airborne particles that range from 0.1- 25 micrometers (µm).

Fumes- these are formed when material a volatilized solid condenses in cool air. The solid particles that are formed make up a fume that is extremely fine- usually less than 1.0 micrometer in diameter. Welding, metalizing and other operations involving vapors from molten metals may produce fumes; these may be harmful under certain conditions.

Gas- state of matter in which the molecules are unrestricted by cohesive forces. Examples are arc- welding gases, internal combustion engine exhaust gases and air.

Inhalation- airborne contaminants that can be inhaled directly into the lungs and can be physically classified as gases, vapors, and particulate matter that includes dusts, fumes, smokes, and mist.

Ingestion- unknowingly eating or drinking harmful chemicals in the workplace.

Mist- suspended liquid droplets generated by condensation of liquids from the vapor back to the liquid state or by breaking up a liquid into a dispersed state such as by splashing or atomizing.

Mg/m3- milligrams of substance per cubic meter of air. The term is most commonly used for expressing concentrations of dusts, metal fumes, or other particles in the air.

OSHA- Occupational Safety and Health Act.

PPm- parts per million parts of contaminated air on a volumetric basis. It is used for expressing the concentration of gas or vapor.

Short- Term Exposure Limit (TVL- STEL)- the maximum concentration to which workers can be exposed continuously for a short period of time without suffering from irritation, chronic or irreversible tissue change, or narcosis of sufficient degree to impair accident proneness, impair self-rescue, or materially reduce work efficiency.

Time-Weighted Average (TLV-TWA)- concentration for which a normal 8 hour workday or 40 hour workweek, to which nearly all workers may be repeated exposed, day after day without adverse effect.

TLV- Threshold Limit Value

Vapor- volatile form of substance that are normally in the solid or liquid state at room temperature and pressure. Some of the most common exposure to vapors in industry occur from organic solvents.

Summary

This chapter explored the reasons for monitoring air in the workplace which were: to determine the magnitude of employee exposure at the start-up of a new process or a change in material used; to justify employee grievance concerning alleged health hazards; to determine performance or effectiveness of engineering controls measure; for research purposes; or to investigate potential health hazards.

Chapter Two

Literature Review

Introduction

There is and will continue to be much interest and activity in the identification and measurement of toxic gases and vapors in the workplace. It is the purpose of this literature review to research available information regarding monitoring air in the workplace by other organizations. The areas covered included the following:

1. Hazard assessment
2. Health hazards and effects
3. Monitoring concepts
4. Sampling protocol:
    A. Instrument specification
    B. Accuracy of instrument
    C. Operating environment
    D. Calibration checks
5. Personal Protective Equipment

Sources of reference included industrial hygiene journals, industrial hygiene periodicals, industry-specific manuals, chemical handbooks, ACIGH manuals, Drager-tube handbooks and personal interviews. This review was completed to provide background for monitoring air at the XYZ treater rooms #13, 15 and the peel room.

Hazard assessment

One of the most important task for a safety professional is a thorough

Analysis of the potential causes of injuries and illnesses. Any occurrence of an unplanned, unwanted event is a piece of data to consider in the prevention of future illness and injuries. Hazard analysis and subsequent dissemination of this information to personnel who will be exposed to the hazards in the future is believed to be the most effective way of preventing injuries and illness (Ray, 1994). The literature of injury case histories is filled with accounts of cases where workers are killed by conditions that had previously caused accidents or injuries to others. One case was taken from OSHA hazard information bulletin to illustrate this point.

In 1994, a tragic fatality apparently caused by exposure to hydrogen sulfide was reported by the Billings, Montana, Area Office. The accident was associated with opening a valve to a sewer cup during the draining of a fuel gas knockout drum in a hydro treating unit of a petroleum refinery. Normal work procedures included periodically opening a valve that carried a water-gas mixture to a separator which removed and vented hydrocarbon gases to a flare. During the preceding winter, the piping to the separator froze, and the drum was temporarily drained to the sewer. The agency believes that due to unclear procedures, the temporary practice of draining some of the water-gas mixture to the sewer in some instances may have been continued, or was incorporated by some workers into the normal draining procedures. The deceased is thought to have opened the valve to the sewer believing it to be part of the draining procedure, resulting in the release of toxic amounts of hydrogen sulfide that killed the him. This was not the first time. The first incident was a near miss two years prior but the condition was never corrected. (OSHA, 1994).

Sometimes hazard assessment leads to a design change in a product or process. In other cases, work procedures are changed to prevent future occurrences or to minimize the adverse effects of these occurrences. Even when nothing can be changed to prevent a future occurrence at least workers can be informed of what happened, what caused the accident, under what conditions the accident might occur again and how to protect themselves in such an event. Informing workers of the facts and causes of accidents that have happened to their co-workers is the most single effective method of training workers to avoid injuries and illnesses (Ray, 1994).

Health hazards and effects

According to John Harte, author of "Toxic A to Z", public awareness of the hazards of toxic chemicals has mushroomed in recent years since the tragic event in Bhopal, India where the accidental release of gas from a pesticide factory killed several thousand people and imposed lingering illness on tens of thousands more (Harte, 1991).

Closer to home, workers at the Ciba Vision plant in Doraville, Georgia had to be evacuated from the entire plant in December, 2000 because of the carbon monoxide build in the boiler room (Atlanta Journal and Constitution, 2001).

Examples like these are not uncommon, yet there are quite a few people who would be amazed at the number of companies in America that work with various chemicals everyday and have no idea what concentration of airborne contaminants their employees are being exposed to. The consequences of not knowing could be deadly or cause untold suffering (frank, 1997).

This section of the literature review discusses the health hazards and effects of the chemicals monitored in the study namely, methyl pyrrolidone, methyl ethyl ketone, dimethylformamide, methanol, and lead.

While methyl pyrrolidone is one of the most important ingredients in the production of printed circuit boards at the XYZ plant in La Crosse, it could be harmful or even deadly if an employee is exposed to high enough concentration. Methyl pyrrolidone is poisonous by intravenous route, toxic by ingestion and intraperiloneal route, and also toxic by skin contact. It can also affect the reproductive system. Mutation data has also been reported. Methyl pyrrolidone is combustible when exposed to heat, open flame, or powerful oxidizers (Lewis, 1997).

Methyl ethyl ketone is another key ingredient in the XYZ product. It is used in conjunction with methyl pyrrolidone in the production of printed circuit boards at XYZ-La Crossee but it can also cause harm to employees if exposed to high concentration.

Methyl ethyl ketone is toxic by ingestion, skin contact, and intraperiloneal routes. Human systemic effects by inhalation and unspecified effect on the nose and respiratory system has been documented. Reaction with hydrogen peroxide and nitric acid forms a heat and shock-sensitive explosive product. It will ignite on contact with potassium tert-butoxide (Lewis, 1997).

Dimethyl form amide is another widely used chemical in the treater rooms at XYZ-La Croose. However, it is suspected carcinogen. It is toxic by ingestion or intravenous. It also causes severe skin and eye irritation (Lewis,1997).

Methonal is used in the treater room at XYZ-La Crosse as a solvent, but at the same time, it is poisonous by ingestion or skin contact as well as inhalation. It is also known to cause changes in blood circulation. It also causes coughing, dyspnea, headaches, vomiting, systemic effects (Lewis, 1997).

Another substance widely at XYZ-La Crosse is lead. Lead is used in the peel room in its liquid form to repair defective products. But lead is a serious heath hazard. It has been known to cause systemic poison by ingestion and inhalation. Major organ system affected are nervous system, blood system and kidney. Experimental evidence suggests that level of lead 10 ug/dL can have the effect of diminishing the IQ score of children (Lewis,1997).

Air Monitoring Concepts

Some industrial hygienist like to separate this topic as direct-reading air monitoring, or time-weighted air monitoring. Direct-reading monitoring is viewed as being much easier to conduct. This generally involves using a direct reading instrument that has been properly calibrated and will give instantaneous feedback of the exposure level of a very specific contaminant and is usually restricted to the measurement of gas or sample substances. There are a limited number of sensors available, unless a photolonization detector, a portable gas chromatography machine or a detector tube is used to detect many more chemicals (Tesmer,2001).

The obvious problem with direct-reading instruments is that they give an instantaneous reading in time and would not show what the employee's average exposure is over an eight-hour day or a specific time period. This type of testing can still be considered valuable information for a situation where employees work at a set location and exposure levels do not fluctuate (Tesmer, 2001).

Time-weighted air monitoring(also referred to as documentation sampling) , on the other hand normally involves samples that required lab analysis. This generally involves having an employee wear a small pump on his or her waist to draw air through a filter cassette, charcoal tube or liquid media over the course of an eight-hour working day, or placing the pump in a designated area (area monitoring) to draw air sample. This type of air monitoring can give an employer accurate exposure levels of a specific worker through the course of the day. The sampling media used can be delivered to an industrial hygiene lab and analyzed with sophisticated equipment to help determine if a respirator is needed or if a current respirator selection is even appropriate.

In most industrial applications, air monitoring is a necessary and useful tool that not only will protect workers' health but also protect a company's liability (laBar, 1997).

Sampling protocol:

Instrument specification- Although specification may appear cryptic, you've got to understand them if your are going to select an instrument suitable for your needs. For example, if you plan on making measurement in steam tunnels where temperature usually exceed 100 F, you better use an instrument capable of operating at that temperature There are many factors that should be considered when selecting an instrument. These include size, weight, ease of use, features and accessories (Rekus, 1997).

Instrument accuracy- one of the most important considerations in selecting any instruments according to Rekus is its accuracy. Accuracy is a measure of how close the instrument is to the actual contaminant concentration. An example illustrated by Rekus is a measurement of 100 ppm made with an instrument with an accuracy of (+ or -) 10 percent could be off 10 ppm in either direction. In other words, the actual concentration could be as high as 110 ppm or as low as 90 ppm (Rekus, 1997). This 20 ppm margin of error could prove harmful or even deadly to employees.

Operating environment**-** Instruments are effected by environmental conditions and they will provide an accurate reading only when operating within prescribe limits for temperature and humidity.

Operating temperatures vary among manufacturers and the selection of an appropriate instrument depends on the temperature to which it may be subjected. Although an instrument may function at low temperatures liquid crystal display may be slower to respond and battery life will be reduced (Rekus,1997).

Relative humidity is another specification to consider. Some instrument manufacturers specify an operating rang in terms of relative humidity (RH). Since warm air can hold more water vapor than cold air, air with a 95% relative humidity at 120 F contains more moisture than air with 95 percent relative humidity at 32 F. Sine relative humidity specifications are based on room temperatures, humidity effects become an important consideration when measurements are made in steam tunnels or hot humid process areas (Rekus, 1997).

Calibration checks**-** Another important factor to consider when monitoring air in the workplace is calibration checks on the instrument. Some manufacturers' instruction manuals recommend checking an instrument's calibration every 30, 60, or 90 days. From a practical perspective, most industrial hygienist disagree. While it may be true for instrument tested under laboratory conditions, it is not necessarily true for instrument in the field. Field instruments are often subject to rough handling and environment conditions which may affect the instrument operation. It is therefore a good practice to calibrate an instrument before every usage (Lawler, 1997).

Personal protective equipment

Personal protective equipment (PPE) is a vital part of any safety and health program. It does not only protect the health and safety of employees, it also fulfills OSHA

regulations to provide a safe and healthy workplace for employees as covered by the general clause (Ray, 1994).

The literature on PPE can easily be compiled into volumes of books. But for the purpose of this research, it is limited to respiratory protection. Of even vital importance than eye and hearing protection is the need for respiratory protection from airborne contaminants.

In fact the new final OSHA standard on person protective equipment imposes several new and important requirements relating to basic safety and health program. The standards adds new general requirements for the selection and use of personal protective equipment (29 1910.32).

Included in these requirements are:

1. Employer must conduct a hazard assessment to determine if hazards present necessitate the use of protective equipment.
2. Employer must certify in writing that the hazard assessment was conducted.

3. Personal protective equipment selection must be made on the basis of hazard assessment and affected workers properly trained.

4. Defective or damaged personal protective equipment must not be used.
5. Training requirements for employees using PPE must be established This should include requirements for employees to demonstrate an understanding of the training.
6. Employers must certify in writing that training programs were provided and understood (29 CFR 1910.134).

There are different types of problems with industrial atmospheres, and the determination of the different types of problems is essential in selecting the correct respiratory equipment. A well-designed and expensive gas mask is useless and might be more properly designated a “death mask” if the atmospheric problem to be tackled is oxygen deficiency, for example (Ray, 1994).

Particularly hazardous atmosphere may be referred to as IDL or IDLH which stand for “Immediately dangerous to life” and “Immediately dangerous to life and health, respectively (Ray, 1994). According to Ray, an effective respiratory protection demands that a well-planed program be implemented , including proper selection of the respirators, fit testing, regular maintenance, and employee training.

Before going any further into the subject of respiratory protection, a classification of the various devices is in order. The two major classifications are “air-purifying” devices and “atmosphere-supplying” devices. The air-purifying are generally cheaper, less cumbersome to operate, and the best alternative if they are capable of handling the particular agent to which the user will be exposed. Under the air-purifying devices are: dust mask, quarter mask, half mask, full face mask, gas mask, and mouthpiece respirator.

Dust mask

The dust mask is the most popular respirator. Approved basically for particulates, some dust mask are approved for mild systemic poisons but are limited to irritants. Despite its limitations, dust mask is popular because it is inexpensive and sanitary.

Quarter mask

Quarter mask, sometimes called the type "B" half mask looks very much like a half mask except that chin does not go inside the mask. The quarter mask is better than the dust mask, but it, too is generally approved for toxic dust no more toxic than lead.

Half mask

Half mask fits underneath the chin and the bridge of the nose. This mask must have four suspension point, two on each side of the mask connected to rubber or elastic about the head.

Full-face mask

The filtering chamber of a full-face mask attaches directly to the chin area of the mask. The filter may be either dual "cartridges" or single "cartridge". The canisters contain granular sorbets which filters the air by absorption or chemical reaction.

Gas mask

Gas mask is designed for canisters that are too large or too heavy to hang directly from the chin. In the gas mask, the canister is suspended by its own harness and is typically connected to the face mask by a corrugated flexible breathing tube.

Mouthpiece mask

Mouthpiece respirator is purposely used for emergency. Breathing is accomplished through the mouth by means of a stem held inside the teeth. A nose clip must be used to prevent inhaling through the nose. The effectiveness of a mouthpiece respirator is greatly dependent on the knowledge and skill of the user.

The other classification of respirator is the “atmosphere-supplying respirator”. Some materials simply cannot be reduced to safe levels by air-purifying devices, and a supplied air system is required. Another important consideration is oxygen deficiency. No amount of filtering or purifying is going to make an oxygen deficient atmosphere safe. The only way to go in this situation is with atmosphere-supplying respirator. There are basically three kinds of atmosphere-supplying respirator: air line respirator, hose mask, and self-contained apparatus.

Air line respirator

The air line respirator derives it name from the way in which air is supplied to the respirator mask. The air is supplied to the mask by a small-diameter hose (not over 300 ft long) which is approved together with the mask. The air is supplied by either cylinders or compressors. The method of delivery of air to the user results in three different modes of air line respirator: “continuous flow”, “demand flow”, and “pressure demand” mode.

In the continuous mode, the air line respirator receives fresh air without any action on the part of the user, that is the flow is forced by the apparatus. One of the advantages of the continuous flow mode is that it permits use of somewhat leaky, loose-fitting hood. The positive pressure differential between the inside and outside of the hood keeps the

flow outward, preventing the toxic agent entry. The continuous flow mode needs an unlimited supply of air. So a compressor is used instead of tanks.

In the demand flow mode, air does not flow until a valve opens, caused by a negative pressure created when the user inhales. Exhalation, in turn closes the valve. This mode has an advantage of using less air, so it is feasible with cylinders. The disadvantage is the need for tight-fitting face piece.

The pressure demand mode has features of both continuous flow and demand flow modes. As in the continuous flow, a positive pressure differential is maintained. The positive pressure is maintained by a preset exhalation valve. Despite its advantages, the demand flow mode still requires a good-fitting mask; used by a person with a beard is not acceptable.

Hood mask

A hose mask is a somewhat crude form of an air respirator. The diameter of the hose is larger than in the air line respirator, permitting air to be inhaled by ordinary lung power. A blower is sometimes used as an assistant. The hose mask is declining in popularity(Ray, 94).

Self-contained breathing Apparatus

In this type of respirator, the user carries the apparatus with him usually on his back. This has an advantage of increasing the distance the user can roam because there is no umbilical cord to drag along and perhaps sever or crush. The disadvantage is that the large pack on the back may restrict from entering in a user close passage like manhole for

example.

Most self-contained breathing apparatus units at the present time are “open circuit”, that is, the exhaled breath is discharged to the atmosphere. “Closed circuit” units recycle the exhaled breath, restoring oxygen levels. The advantage of the closed-circuit types is that the pack can be much smaller and lighter.

Summary

The literature review examined information regarding monitoring air in the workplace. The review included monitoring concepts, health hazards and effects, and sampling protocol which included instrument specification, accuracy, operating environment, and calibration checks and personal protective equipment.

The research resulted in a list of critical components of monitoring air in the workplace. These component were used in the actual analysis of the field problem.

Chapter III

Methodology

Introduction

The purpose of this chapter is to provide the reader with the outline of the sources and methodology used to collect data which was used to complete the study. The sources of the research data are as follow:

A. Literature review

B. General observation

C. Hazard assessment

D. Employee interviews

E. Sampling

Literature review

A review of related literature was conducted to identify current and past issues as they relate to monitoring air at the XYZ- La Crosse plant, in Wisconsin. The background information obtained from this research provided the baseline requirements needed for achieving a successful control method.

As alluded to in chapter one, generally where employees may be expose to potential health hazards, sampling is performed on a routine basis. In addition, sampling for air contaminants may be perform for one or more of the following reasons: 1) to determine the magnitude of employees exposure at a startup of a new process or change in a process or material used, 2) to determine the justification of employees grievances concerning alleged health hazards, 3) to determine the performance or effectiveness of

engineering control or measures, 4) for research purposes such as to determine chemical and or physical characteristics of contaminants, 5) to investigate a potential health problem on a corporate wide basis.

Motivated by the fourth reason above, the researcher set out to perform area monitoring in treater room #13 for methyl pyrrolidone and methyl ethyl ketone; treater room #15 for dimethyl form amide, methanol, and methyl ethyl ketone; and the peel room was monitored for lead.

General observation

A general observation was made of all employees in the treater rooms and the peel room to gain a basic understanding of the process and the physical tasks involved. This phase identified potential exposure as needing further analysis.

Hazard assessment

A hazard assessment was performed on the process in the various rooms. The analysis identified the tasks, assessed potential hazards, gave a brief description of the task and provided an analysis of the chemicals exposure associated with the tasks.

Employees interviews

Employees in the treater rooms and the peel room were informally interviewed at different times at their respective worksites. The interviews were conducted by the author. Various questions were asked which assisted in the determination of whether or not environmental stressors exit. Data was collected to pinpoint the duration of the tasks and kind of exposure. The data was then used in conjunction with ACGIH standards. A baseline was established to justify the need for corrective action. The employee are not

identified in order to provide confidentiality.

Sampling

Prior to taken the samples, an industrial hygiene forms were developed by the researcher to aid the researcher in collecting the sample data. The forms contained information such as: sample method, material sampled, calibration, air inflow, air outflow, date, etc.

Secondly, the MSA universal hand pumps, which were used to take the samples were calibrated. It is essential that each sampling device be accurately calibrated to insure its precision and its availability for use. The exposure of workers to potential health hazards in the working environment can be properly evaluated only by qualitative and quantitative measurement. The validity of such measurement depends upon the accuracy of the sampling.

The MSA universal hand pump is a calibrated piston type pump with variable orifices which is used with indicating tubes to obtain instantaneous air samples.

For calibration, the pump is connected by tubing to the tapered end of a burette (see appendix 4). The piston is withdrawn and locked in the 100 cc position. The petcock of the burette is opened, the bubble rise through the burette, and a volume of 80 cc is timed with a stopwatch. If the flow rate of the orifice do no conform to the manufacturer's recommendations then the pump need to be repaired.

After calibration, samples were taken in treater rooms number 13, 15 and the peel room. The American Conference of Governmental Industrial Hygienist (ACGIH)

standard, which is more stringent than OSHA standard was followed in collecting the samples.

Chemicals monitored were methyl pyrrolidone and methyl ethyl ketone in treater room #13, dimethyl form amide, methanol and methyl ethyl ketone in treater room #15, and lead in the peel room. These are controlled substances that must be monitored in the workplace according to OSHA regulations.

After careful calibration of the MSA universal hand pumps, a sample was taken in treater room #13 at the west end running product 25, batch #2-C1 706 30-01A which contained methyl pyrrolidone and methyl ethyl ketone. Sample was taken about 9 feet to the left of the dip pan, approximately 4 ½ feet from the floor near the vacuum pump (see appendix 1).

The pumps were on from 9:35 AM to 1:05 PM for a total time of 210 minutes as required by ACGIH standards. Sample volume was 10.5L. Media used for collecting the sample was a charcoal tube.

In the treater #15 room, three MSA hand universal hand pumps were also used simultaneously to collect samples of dimethyl form amide, methyl ethyl ketone, and methanol which were also present in the low DK R&D product being run.

Samples were taken at the west end of the room approximately 3 feet from the dip pan on the left side and about 5 feet from the floor. All enclosures were in place (see appendix 2).

The pumps were on from 9:50 AM to 12:50 PM for a total time of 180 minutes per pump. Volume for dimethyl form amide was 18L and volume for methanol was 9 L.

Media for dimethyl form amide was a silica gel and media for methanol was also sicila gel.

The next area where sample was taken was the peel room. Liquid lead is used in the peel room to repair defective products. Sample was taken at the solder pot about 18 inches above and in front of the solder pot. All three exhausts (#312, 450, and 235) were operational. (see appendix 3).

The pump was on from 12:50 PM to 3:50 PM for a total of 180 minutes. Media used was MCF filter, and the volume was 360L

Data Analysis

After samples were taken, the samples were uniquely labeled and sent to NATLSCO laboratory in Long Grove IL for analysis. The results were compared to the ACGIH TLVs and presented in a table format to determine whether or not employees were expose.

Chapter IV

Results

Introduction

The purpose of this study was to develop an exposure assessment plan for the XYZ- La Crosse to monitor the following areas: (1). Treater room #13, (2). treater room #15, and (3). the peel room.

Treater room # 13 was monitored for methyl pyrrolidone, a toxic chemical which affects the reproductive system, and causes mutation in humans when expose to high concentration and methyl ethyl ketone, another toxic chemical which affects the respiratory system.

Treater room #15 was also monitored for methyl ethyl ketone, dimethyl form amide, and methanol. As mentioned in the second paragraph, methyl ethyl ketone affects the respiratory system. On the other hand, dimethyl form amide is carcinogenic, while methanol causes change in the blood circulation.

The other area monitored was the peel room. The peel room was monitored for lead. Lead is known to cause systemic poison and diminishing IQ in children.

A review of related literature was conducted to identify both current and past issues as they relate to monitoring air at the XYZ- La Crosse plant. The background information obtained from this research provided a baseline requirement for achieving a successful control method.

General observation was also made by the researcher to aid the researcher in achieving the objectives of the study which were: to perform area monitoring and compare

the results to ACGIH TLVs.

Monitoring

As alluded to in chapter one, air monitoring in the work environment can be attributed to any number of the five factors mentioned in chapter one. However, for the purpose of this study, monitoring was conducted in the treater rooms and the peel room at XYZl- La Crosse in order to insure a healthier safer working environment.

In treater room #13, the air was monitored for both methyl pyrrolidone and methyl ethyl ketone. The results for methyl pyrrolidone was 3.0 ppm which was significantly less than the ACGIH TLV and the result for methyl ethyle ketone of 37 ppm was also less than the ACGIH (see table 1 below).

Table #1

	Results(ppm)	ACGIH (TLV)
Methyl ethyl ketone	37 ppm	200 ppm

In treater room #15, the air was monitored for dimethyl form amide, methanol, and methyl ethyl ketone. The result for dimethyl form amide was 9.2 ppm compare to ACGIH 10 ppm, while the result for methyl ethyl ketone was 13 ppm compare to ACGIH 200 ppm. Th result for methanol was was 3.2 ppm compare to 200 ppm (see table 2 below).

Table #2	Result (ppm)	ACGIH TLV
Dimethyl form amide	9.2 ppm	10 ppm
Methyl ethyl ketone	13 ppm	200 ppm
Methanol	3.2 ppm	200 ppm

Another area that was monitored was the peel room. The peel room was monitored for lead. The result was significantly less than the ACGIH TLV, 0.0014 mg/m3 compare to 0.5 mg/m3 (see table 3 below).

Table #3	Result (ppm)	ACGIH TLV
Lead	0.0014 mg/m3	0.05 mg/m3

Summary

To summarize, treater rooms #13, 15 and the peel room were monitored, data was collected, and the results were compare to ACGIH TLV and presented in a table format above.

Chapter v

Conclusions and Recommendations

Introduction

The purpose of this chapter was to present a summary of the study. The summary includes restatement of the problem, methods and procedures used, major findings, conclusions and recommendations.

Summary

The problem of the study was to monitored the air in treater rooms #13 for methyl pyrrolidone and methyl ethyl ketone; treater room #15 for dimethyl form amide, methanol, and methyl ethyl ketone, and lead in the peel room.

Methods and procedures

A review of related literature was conducted to identify both current and past issues as they relate to monitoring air at the XYZ- La Croose. The information obtained from this research provided the baseline requirements needed for achieving a successful control method.

General observation

A general observation was made of the employees in the treater room as well as in the peel room to gain an understanding of the process and the physical tasks involved.

Task analysis

A task analysis was performed by the researcher on the process in the various rooms. The analysis identified the tasks, gave a brief description of the task and provided an analysis of the chemicals exposure associated with the particular task.

Interview

Employees in the treater rooms as well as in the peel room were interviewed at different times at their respective workstations. Data was collected to pinpoint the duration of the task and potential hazards. The data was used in conjunction with ACGIH standards to establish a baseline in order to justify the need for corrective action if needs be.

Sampling

Prior to taking samples, an industrial hygiene form was developed by the researcher to aid
the researcher in collecting the samples. The form contained information about sample method, material sampled, calibration, air flow rate, etc.

Secondly, the MSA universal hand pumps that were used to draw sample were carefully calibrated to ensure accuracy and availability for use. After calibration,samples were taken in treater room #13, 15, and the peel room for the study. The American Conference of governmental Industrial Hygienist (ACHIG) standards was followed in collecting the samples.

Treater #13 was monitored for methyl pyrrolidone and methyl ethyl ketone. Treater #15 was monitored for dimethyl form amide, methanol, and methyl ethyl ketone, while the peel room was monitored for lead.

Data analysis

After the samples were taken, they were uniquely labeled and sent to NATLSCO laboratory in Long Grove IL. And the after the analysis, the results were compared to ACGIH TLV.

Major findings

After careful monitoring of the treater rooms and the peel room, the findings were as follow: level of methyl pyrrolidone in treater room #13 was 3.0 ppm, whereas the level of methyl ethyl ketone in the same room was 37 ppm In treater room #15, the level of dimethyl form amide was 10 ppm, methanol 3.2 ppm and methyl ethy ketone, 13 ppm. The level for lead in the peel room was 0.0014 mg/m3.

Conclusion

There seems to be a healthier, safer, working environment at XYZ- La Crosse treater rooms #13, 15 and the peel room. The fact that the level of methyl pyrrolidone in treater #13 was only 3.0 ppm and that of methyl ethyl ketone was only 37 ppm compared to the ACGIH TLV of 100 ppm for methyl pyrrolidone, and 200 ppm for methyl ethy ketone respectively, indicate that there is no significant exposure risk in treater room #13.

Next was the treater room #15, as indicated by the low level of methyl ethyl ketone and methanol, there appears to be no significant exposure risk for those chemicals either. However, the level of dimethyl form amide in treater room #15 though below ACGIH TLV was high, 9.2 ppm compared to 10 ppm. Therefore there may be some exposure risk in treater room #15 for dimethyl form amide.

As indicated by the result, the level of lead in the peel room was almost negligible, 0.0014 mg/m3 compared to 0.05 mg/m3 ACGIH TLV. Therefore, it is safe to say that there is no significant exposure risk in the peel room.

Recommendations

To maintain a healthier and safer working environment is not a one time proposition. It is a continuous process. There are so many variables in the working environment to consider such as, temperature change, humidity, gases, etc. In light of that, the following recommendations were made:

1. Air sampling should be conducted periodically in treater room # 13 for dimethyl form amide, methonal, and methyl ethyl ketone to make sure employees are not expose to these chemicals. As stated in paragraph one above, there are many variables in the working environment that may cause changes in the environment such as: humidity, gases, etc.

The fact that there is no significant risk of exposure today does not mean that there will be no risk tomorrow. Those environmental factors mentioned above may change without warning thus, creating exposure risk. Therefore, a periodic monitoring is strongly recommended.

2. As alluded to in chapter three, lead in any environment is a concern. The effect of lead on the reproductive and nervous systems has been well documented. Though the level of lead in the peel room was negligible, every effort should be made to make sure it remains that way. Therefore, it is recommended that liquid-lead in the peel room be covered at all times except when it is about to be used.

3. Training is at the core of any risk control program. Dissemination of information to employees who will be exposed to hazards is believed to be the most effective way of preventing injuries and illnesses. Therefore it is recommended that XYZ company institute a comprehensive training program in hazard recognition, characteristics and effects of

hazardous chemicals with which they work.

4. As mentioned in chapter four, dimethyl form amide is carcinogenic. In treater room # 15 where the level of dimethyl form amide was high (9.2 ppm compare to ACGIH TLV of 10 ppm), personal protective equipment is highly recommended to prevent exposure.

5. Last but not least, is housekeeping, good work hygiene should be maintained to protect employees' health and safety.

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Appendix 1

Sample No.	Material Sample For	Date	Sampled By:
7297-2	Methyl Ethyl Ketone (MEK)	7/2/97	C. Gono

Sample Location: Treater # 13	Type: ☐ Area ☐ Person ☐ Passive ☐ Blank

Plant	Job Title/Unit	SSN	Shift
La Crosse			

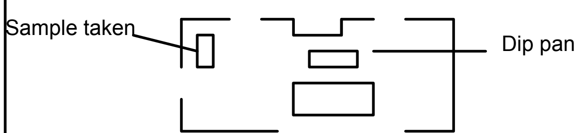
Barometer	Temperature	Wind	Humidity

Description of activities during sampling

Sample was taken at the west end of treater # 13 running P-25 batch # 2-C1-70630-01A 9 Ft. to the left of the dip pan about 4 1/2 Ft. from the floor on the vaccum pump.

PPE Worm:

Scketch Area



Calibrated By:	Method	Initial Flow Rate	Final Flow Rate	Average Sample Flow Rate
C. Gono	Rotometer	50 cc/min	50 cc	50 cc

Time on	Time off	Total Time	Volume
9:35 AM	1:05 pm	210 min.	10.5 L

Sample Collector:

- ☐ MCE Filter
- ☐ PVC Filter
- ☐ Impinger
- ☐ Silica Gel
- ☒ Charcoal Tube
- ☐ Passive Dosimeter
- ☐ Other

Analysis By:

- ☐ NATLSCO
- ☐ WAUSAU
- ☐ ASSY TECHNOLOGY
- ☐ Other

Results-Hour TWA: 37 PPM	Comments: Result below ACIGH TLV		
Standards:	☐ OSHA	☒ ACGIH: 200 PPM	☐ Company XYZ

☐ Employee has been informed of results

Employee Signature Date

Appendix 2

Sample No.	Material Sampled For	Date	Sampled By:
7297-2	Methyl Pyrrolidone	7/2/97	C. Gono

Sample Location: Treater # 13 | Type: ☒ Area ☐ Person ☐ Passive ☐ Blank

Plant	Job Title/Unit	SSN	Shift
La Crosse			

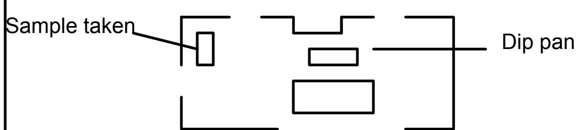
Barometer	Temperature	Wind	Humidity

Description of activities during sampling

Sample was taken at the west end of treater # 13 running P-25 batch # 2-C1-70630-01A 9 Ft. to the left of the dip pan about 4 1/2 Ft. from the floor on the vaccum pump.

PPE Worm:

Scketch Area



Calibrated By:	Method	Initial Flow Rate	Final Flow Rate	Average Sample Flow Rate
C. Gono	Rotometer	50 cc/min	50 cc	50 cc

Time on	Time off	Total Time	Volume
9:35 AM	1:05 pm	210 min.	10.5 L

Sample Collector:

- ☐ MCE Filter
- ☐ PVC Filter
- ☐ Impinger
- ☐ Silica Gel
- ☒ Charcoal Tube
- ☐ Passive Dosimeter
- ☐ Other

Analysis By:

- ☒ NATLSCO
- ☐ WAUSAU
- ☐ ASSY TECHNOLOGY
- ☐ Other

Results-Hour TWA: 37 PPM	Comments: Result below ACIGH TLV		
Standards:	☐ OSHA	☒ ACGIH: 200 PPM	☐ Company XYZ

☐ Employee has been informed of results

Employee Signature Date

Appendix 3

Sample No.	Material Sample For	Date	Sampled By:
7297-24	Dimethyl Formamide	7/2/97	C. Gono

Sample Location: Treater # 15	Type: ☒ Area ☐ Person ☐ Passive ☐ Blank

Plant	Job Title/Unit	SSN	Shift
La Crosse			

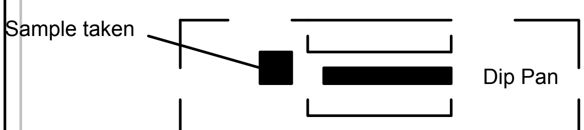
Barometer	Temperature	Wind	Humidity

Description of activities during sampling

Sample taken at Treater # 15 west end running Low DK with MEK, DMF and Methanol. R&D run. Sample taken approximately 3 ft. from pan on the left side and about 5 ft. from the floor. All enclosures in place except for the back.

PPE Worm:

Scketch Area



Calibrated By:	Method	Initial Flow Rate	Final Flow Rate	Average Sample Flow Rate
C. Gono	Rotometer	100 cc	100 cc	100 cc

Time on	Time off	Total Time	Volume
9:50 AM	12:50 PM	180 Min.	18 L

Sample Collector:

- ☐ MCE Filter
- ☐ PVC Filter
- ☐ Impinger
- ☒ Silica Gel
- ☐ Charcoal Tube
- ☐ Passive Dosimeter
- ☐ Other

Analysis By:

- ☒ NATLSCO
- ☐ WAUSAU
- ☐ ASSY TECHNOLOGY
- ☐ Other

Results-Hour TWA: 9.2 PPM	Comments: Result below ACIGH TLV		
Standards:	☐ OSHA	☒ ACGIH: 10 PPM	☐ Company XYZ

☐ Employee has been informed of results

Employee Signature Date

Appendix 4

Sample No.	Material Sample For	Date	Sampled By:
7297-6	Methyl Ethyl Ketone (MEK)	7/2/97	C. Gono

Sample Location: Treater # 15 | Type: ☒ Area ☐ Person ☐ Passive ☐ Blank

Plant	Job Title/Unit	SSN	Shift
La Crosse			

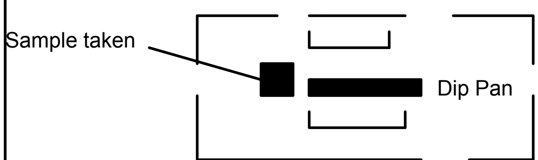
Barometer	Temperature	Wind	Humidity

Description of activities during sampling

Sample taken at treater # 15 west end running Low DK with DMF, and Methonal. R&D run. Sample taken approximately 3 ft. from the dip pan on the left side and about 5 ft. from the floor. All enclosures in place except for the back.

PPE Worm:

Scketch Area



Calibrated By:	Method	Initial Flow Rate	Final Flow Rate	Average Sample Flow Rate
C. Gono	Rotometer	50 cc/min	50 cc	50 cc

Time on	Time off	Total Time	Volume
9.50 AM	1:20 PM	210 min.	10.5 L

Sample Collector:

☐ MCE Filter
☐ PVC Filter
☐ Impinger
☐ Silica Gel
☒ Charcoal Tube
☐ Passive Dosimeter
☐ Other

Analysis By:

☒ NATLSCO
☐ WAUSAU
☐ ASSY TECHNOLOGY
☐ Other

Results-Hour TWA: 13 PPM	Comments: Result below ACIGH TLV		
Standards:	☐ OSHA	☒ ACGIH: 200 PPM	☐ Company XYZ

☐ Employee has been informed of results

Employee Signature Date

Appendix 5

Sample No.	Material Sample For	Date	Sampled By:
7297-3	Lead	7/2/97	C. Gono

Sample Location: Peel Room | Type: ☒ Area ☐ Person ☐ Passive ☐ Blank

Plant	Job Title/Unit	SSN	Shift
La Crosse			

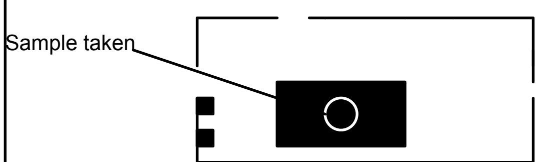
Barometer	Temperature	Wind	Humidity

Description of activities during sampling

Sample taken at solder pot approximately 18" above and in front of the pot. All 3 exhaust (312, 450 and 235) were operational. Solder pot was on.

PPE Worm:

Scketch Area



Calibrated By:	Method	Initial Flow Rate	Final Flow Rate	Average Sample Flow Rate
C. Gono	Rotometer	2 LPM	2 LPM	2 LPM

Time on	Time off	Total Time	Volume
12.50 PM	3.50 PM	180 MIN.	360 L

Sample Collector:

- ☐ MCE Filter
- ☐ PVC Filter
- ☐ Impinger
- ☐ Silica Gel
- ☐ Charcoal Tube
- ☐ Passive Dosimeter
- ☐ Other

Analysis By:

- ☒ NATLSCO
- ☐ WAUSAU
- ☐ ASSY TECHNOLOGY
- ☐ Other

Results-Hour TWA: 0.0014 mg/m3	Comments: Result below ACIGH TLV		
Standards:	☐ OSHA	☒ ACGIH: 200 PPM	☐ Company XYZ

☐ Employee has been informed of results

Employee Signature Date